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THE EFFECT OF MOLTING ON RHEOTAXIS IN  
ISOPODS

IN an earlier paper<sup>1</sup> I showed that the strength of a current in which stream isopods can maintain themselves is determined by the period of weakened responses during the breeding season. More recent studies have shown that the shorter but more frequently recurring molting period is also of importance in this respect.

The molt in the isopod, *Asellus communis* Say, usually occurs at intervals of from 13 to 25 days, although over 70 days may elapse between molts. Normally the covering breaks between the fourth and fifth thoracic segments. Either the anterior or posterior part may be shed first. Both may be molted the same night or as long as four days may intervene between the molting of the two halves. At times parts or all of the covering may be molted, segment by segment, or even parts of a segment may break off; as long as nine days has been observed to be spent in molting the abdomen alone.

The influence of this period on the rheotactic reaction is typically shown by the following account of the responses of an isopod during one molting period. The isopod under observation was a male, 12 mm. long, which averaged normally 86 per cent. positive rheotactic reactions. The molt began just after a test of 11 trials which averaged 35 per cent. positive, 35 per cent. negative and 30 per cent. indefinite. During each minute's reaction the isopod moved an average distance of 40 centimeters.

The covering broke between the fourth and fifth thoracic segments and the forward part was worked off over the head by a series of undulating motions of the body and by movements of all the legs. It took 70 seconds to complete the process. One of the antennæ that had been dragging before the molt occurred was dropped off with the exuvia. Im-

mediately after the molt the forelegs were smaller than usual.

During the process the isopod stayed in one place and disregarded all currents. A current set up immediately after the molt was completed was also disregarded. After about two minutes in the same place the isopod moved across the pan and stopped in an angle 17 cm. away. It rested there quietly for seventeen minutes, when it was again tested for rheotactic reaction. No movement occurred. At thirty minutes after molting 10 trials showed 30 per cent. positive, 60 per cent. indefinite and 10 per cent. no reaction at all. The average reaction distance per minute was 38 cm.

At this time the isopod was more sensitive to touch stimuli than usual. In the response just given it twice ran into another isopod with its antennæ and jumped back over a centimeter each time, although normally there would have been almost no negative reaction.

Three hours after molting, 70 per cent. of the reactions were positive, and two hours later 90 per cent. were positive and the reaction distance was 47 cm. This last trial was characterized by the steady movements and rapid, definite orienting that mark the normal response of stream isopods.

In this case the molt of the posterior part occurred two days later, after nine p.m. At nine the response was: 40 per cent. positive, 40 per cent. negative and 20 per cent. indefinite. The next morning 80 per cent. of the responses were positive and the other 20 per cent. were negative. The reaction distance was only slightly greater in the morning readings. On the morning after the next molt 31 days later, this isopod would start positive and turn negative as though the current pressure against the more sensitive covering was painful.

An isopod stands higher from the bottom when nearing molting time, which is probably due to the increasing stiffness of its legs. At this time the posterior legs appear harder to move and may become tangled, thus throwing the isopod as it tries to crawl. Immediately after the molt it is more easily swept off its

<sup>1</sup> Allee, W. C., 1912, "An Experimental Analysis of the Relation between Physiological States and Rheotaxis in Isopoda," *Jour. Exp. Zool.*, Vol. 13, pp. 269-344.

feet than during other parts of the molting cycle.

The more gradual molts may also affect the rheotactic reaction. A cut of 20 per cent. in the positive response has been observed when one segment was molted. Regulation from depressed to normal positiveness occurs more rapidly after a molt than at any other time.

The detailed account just given shows that the effect of the molting period lasted for about five hours after the actual ecdysis took place. If the period extended as long beforehand it would make the time during which the rheotactic response is affected by the molting process extend over a period of ten hours. Since both the rheotactic and thigmotactic responses are weakened, this must be a critical time in the life of the stream isopod.

W. C. ALLEE

A NEVADA RECORD FOR THE CANADA OTTER,  
*LUTRA CANADENSIS* (SCHREBER)

No otter has apparently been known from Nevada, although *Lutra canadensis* is known to occur in Idaho, and the type specimen of *L. canadensis sonora* (Rhoads) was taken at Montezuma Well, Yavapai County, Arizona. The Walker-Newcomb Expedition of the University of Michigan, in the summer of 1912, found a species common on the Humboldt River in the vicinity of Elko and Carlin, in the northeastern part of the state, and from a trapper a specimen was secured for the Museum of Zoology (Cat. No. 44,419).

The specimen obtained, a large adult male, is evidently to be referred to *L. canadensis*, as at present defined. The coloration is not as pale as described for *L. c. sonora*, being dark liver-brown above and paler below, the cheeks, lips, chin and throat whitish; and the post-orbital processes are not attenuated, as in *L. c. sonora*, but short and stout, as in typical *L. canadensis*.

ALEXANDER G. RUTHVEN,  
FREDERICK M. GAIGE

SOCIETIES AND ACADEMIES

THE BOTANICAL SOCIETY OF WASHINGTON

THE eighty-seventh regular meeting of the Botanical Society of Washington was held at the Hotel Cochran, February 25, 1913. This was the

regular annual opening meeting of the society. Fifty members and forty-two guests were present.

The retiring president, Mr. W. A. Orton, delivered an address entitled "Environmental Influences in the Pathology of *Solanum tuberosum*." This paper was published in the *Journal of the Washington Academy of Sciences* (Vol. 3, p. 180, April 4, 1913).

The eighty-eighth regular meeting was held in Assembly Hall, Cosmos Club, Tuesday evening, April 1, 1913.

Mr. James T. Jardine was elected to membership.

The following papers were presented:

*Notes on Diseases of Trees caused by Mistletoes:*

Dr. G. G. HEDGCOCK.

Mistletoes are found only on conifers in northern and northeastern United States; only on angiosperms in southeastern and southern portions; and on both in western and southwestern regions, where they are the most widely disseminated.

The rate of spread of mistletoes is without doubt very slow. Near Frazer, Colorado, on an old burn in the forest, the rate of spread of *Razoumofskyia americana* (Nutt.) Kuntze on the lodge pole pines (*Pinus contorta* Lond.) is estimated to be from 6 to 12 feet per annum, where mechanical expulsion of the seeds aided by winds are the controlling factors. Sporadic infections at much greater distances are caused possibly by birds or animals.

Light is the most important factor in determining the spread of mistletoes of species of both *Razoumofskyia* and *Phoradendron*. Trees in the open, and in more exposed conditions, whether on ridges or edges of canyons or on level areas are most subject to attacks by mistletoes of both genera on account of the abundance of light. Trees in dense forests are not subject to attack. Mistletoes are stunted by dense shade, and bear but few, if any seeds, and can not well maintain themselves under conditions where the light is deficient.

One of the immediate effects of the presence of the sinkers of these parasites in the tissues of host trees and shrubs is a tendency to hypertrophy in the immediate region of penetration. In case of species of *Phoradendron*, unless the mistletoe plant is broken off there is little or no tendency for its sinkers to spread laterally in the tissues of the host, and when broken off, the rate of spread is slow, and no witches brooms are formed. In case of species of *Razoumofskyia*, witches brooms are commonly produced. The lateral sinkers in such cases spread in the soft tissues of the host, keeping